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# TRANSGENEX NANOBIOTECH INC.

**By Jim Kling (Contributor), *Start-Up* 4/2008**

## *Executive Summary*

TransGenex Nanobiotech is taking a multi-pronged approach to building a nanotechnology company. In the short term, the company is generating revenue from sales of its custom nanoparticles and its Nanogene reagents that can be used to deliver genes to cells. It is also using its technology to develop diagnostic platforms, especially for lung and ovarian cancer. Finally, TransGenex plans to develop its own novel drug candidates. It's focusing first on products with anti-inflammatory properties, which could find application in asthma as well as several cancers.

TransGenex is taking a varied approach to developing a nanotechnology company. In the short term, the company is generating revenue from sales of custom nanoparticles and its Nanogene™ reagents that can be used to deliver genes to cells. It will also use federal and state small business grants to support R&D.

Currently available nanoparticle products include chitosan nanoparticles, magnetic nanoparticles, hybrid particles (polymer-magnetic), and especially custom functionalized nanoparticles that may be used for diagnosis and imaging purposes.

The company is also using its nanotechnology to develop diagnostic platforms, especially for lung and ovarian cancer. Finally, the company plans to develop its own novel drug candidate with anti-inflammatory properties, which could find application in asthma as well as several cancers. "We think that with the (diagnostics) platform we can raise some revenue, which will help us go into the IND and phase I and II clinical trials" with the drug candidate, says Shyam S. Mohapatra, a professor of medicine at the University of South Florida, and a co-founder and chairman of the board at TransGenex.

For its nanoparticles, TransGenex has chosen to work with chitosan, which is a natural, biodegradable polymer that is also marketed as a diet supplement. There is no evidence of any toxicity associated with it, Mohapatra says. TransGenex's SiPlex™ technology combines nanoparticle delivery and RNA interference (siRNA). The platform can be modified to target specific tissues to provide a slow, sustained release of a gene or drug. "It can be given easily, as a nasal drop, or orally. We can even do it as a topical cream," says Mohapatra. The surface of nanoparticles can also be functionalized using antibodies or other molecules to target cancer cells and deliver the siRNA directly to them.

In a diagnostic instrument (created using TransGenex's ULTraPID™ platform), nanoparticles can be used to immobilize peptides or proteins that bind to the agent to be detected. Because nanoparticles are so small, they collectively have a much higher surface area that a traditional diagnostic platforms – think of the nooks and crannies in a bucket of golf balls. As a result, many more surfaces are available to attach signaling agents, and that dramatically improves the strength of the signal and yields much faster results, Mohapatra says. TransGenex is also using a microfluidics platform in combination with the nanoparticles and nanowires to develop diagnostics capable of detecting multiple biomarkers simultaneously. "If you have 5 or 10 biomarkers detected together, you have more confidence" in the result, says Mohapatra.

ULTraPID™ is approximately 1,000 times more sensitive than existing techniques, Mohapatra says. Rapid results can be critical in some situations -- for example, during transplant surgeries and blood transfusions. "We're talking minutes or hours (to get a result). For many tests right now, it takes days," says Mohapatra.

The company has done proof of concept studies in prostate and ovarian cancer, and plans to perform studies using clinical samples. Mohapatra hopes to take 500 to 1,000 known clinical samples and determine the test's ability to confirm the clinical diagnosis. "That's where the R&D is focused," says Mohapatra.

Initial applications will focus on HIV and cancer detection, though TransGenex plans to extend it to a variety of human diseases. It could find its way into devices ranging from dip-stick detection kits sold in homes to clinical diagnostics. Mohapatra envisions kits to rapidly detect HIV, hepatitis C virus, and others.

The ovarian cancer and lung cancer diagnostic systems have performed well in animal trials, and the company is evaluating these two forms of cancers going forward. Much depends on the willingness of a partner, Lucas says.

Nanoparticles can also improve imaging in diagnostics. For example, magnetic resonance imaging (MRI) is a commonly used diagnostic tool. Reagents are often injected into the patient in advance of the MRI scan so that they can localize to a tumor. But existing reagents need refinement, says Mohapatra, and can lead to fuzzy, inconclusive results. "You can see a clump of cells, but not what state it's in. If you enhance the resolution with an improved imaging reagent, you can say it's a stage III cancer," says Mohapatra. TransGenex R & D focuses on producing these magnetic nanoparticles and it actually is another area where TransGenex is for a partner.

On the therapeutic side, TransGenex is looking to partner with other companies that are looking for nanotech approaches to improve the solubility or efficacy of existing drugs. TransGenex has signed an agreement with one firm for its therapeutics platform, which is undergoing due diligence.

TransGenex also has a program to develop novel drugs. Mohapatra and his team at the University of South Florida have identified a novel anti-cancer target – a receptor that

appears to play an important role in tumor formation. The receptor (natriuretic peptide receptor A, or NPRA) is a target of natriuretic peptides, which have already been implicated in cancer. New research by Mohapatra and his colleagues showed that mice that lack this receptor were protected from lung, skin, and ovarian cancers. In normal mice, the researchers applied RNA interference (siRNA) – a short strand of RNA that blocks expression of the receptor – and found that it protected the mice from developing melanoma tumors. The siRNA was packaged in TransGenex's proprietary nanoparticles.

NPRA also appears to play a role in the immune response, making it a potential drug target in asthma and other immune-related diseases, says Mohapatra.

John Lucas, TransGenex's president and CEO, has had talks with several major drug companies regarding the NPRA siRNA product, including Lilly, Novartis, and others, but hasn't inked any deals yet. "We're looking for one of those companies to step up to the plate and risk maybe $3-5 million," he says. The company hopes that such a partnership will lead to an IND, at which point a partner could take over exclusive marketing rights and fund the clinical development.

Transgenex is willing to discuss licensing of the nanotechnology platform to be used with a partner's drug, or the platform combined with their novel NPRA product, Lucas says. The nanoparticles can also be used with other drugs besides siRNA, though that is the field that has dominated TransGenex's discussions to date.

The combined market for TransGenex's products – in vitro diagnostics for HIV and cancers, and nanoparticle therapeutics for cancer, asthma and chronic respiratory diseases – is expected to reach $200 billion by 2013.

An IND could be filed within three years. Lucas expects that a diagnostic could get fast-tracked because of the unmeet need – lung cancer and ovarian cancer are particularly deadly because they are rarely detected before they have metastasized and become difficult to treat.